Aug. 26, 1947. H. RUTISHAUSER ET AL 2,426,526

TWO PIECE JET THRUST MOTOR

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Fig. 1.

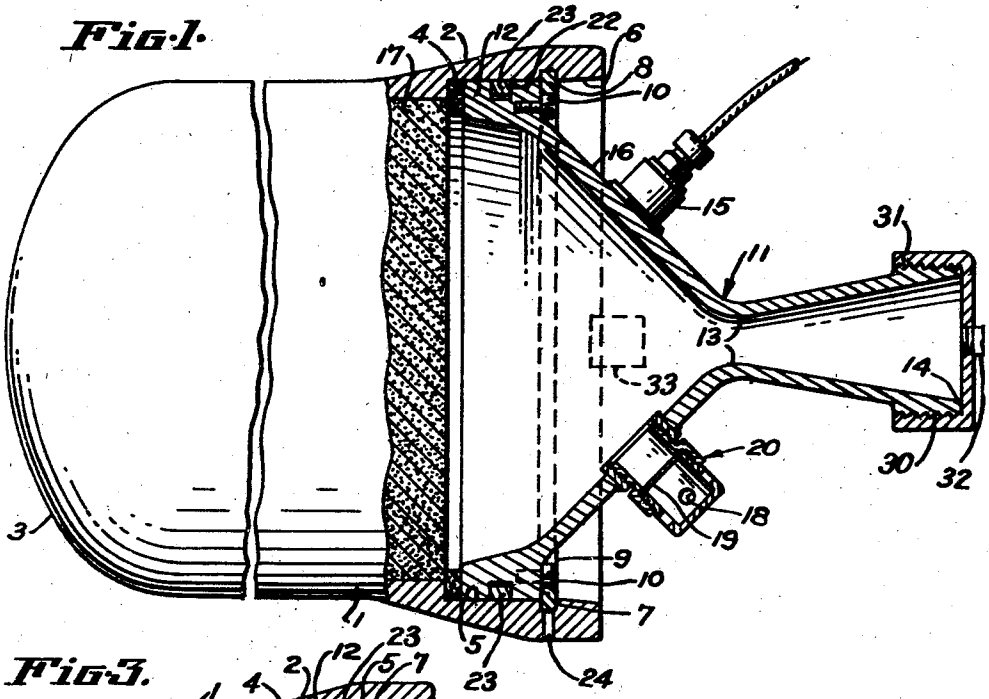


Fig. 3.

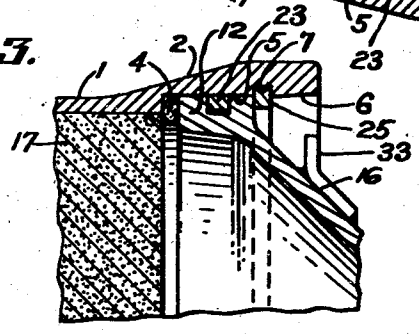


Fig. 2.

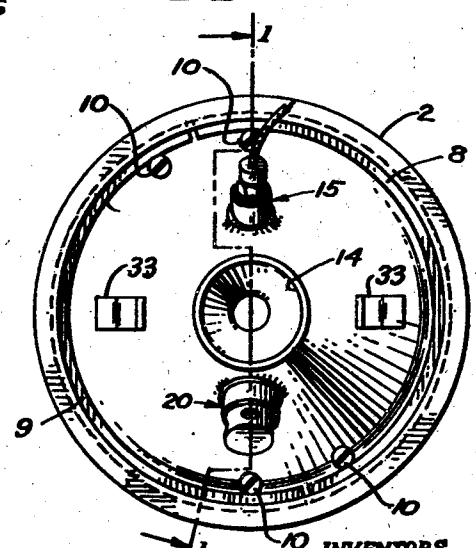
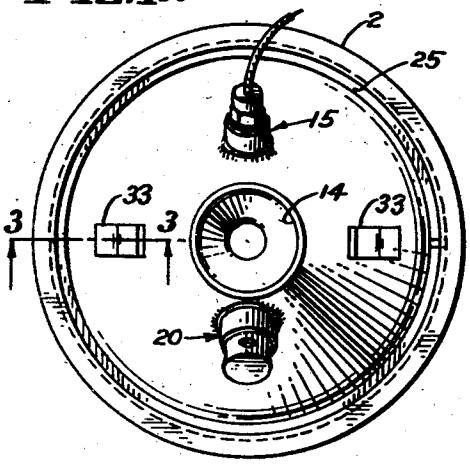


Fig. 4.



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Fig. 7.

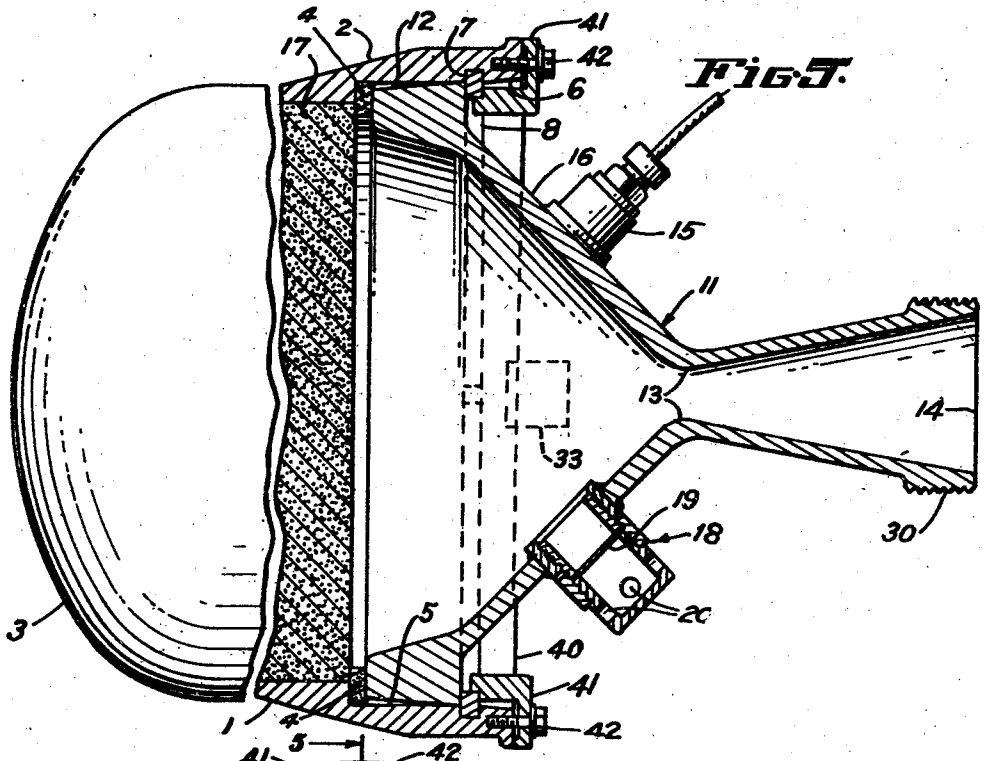
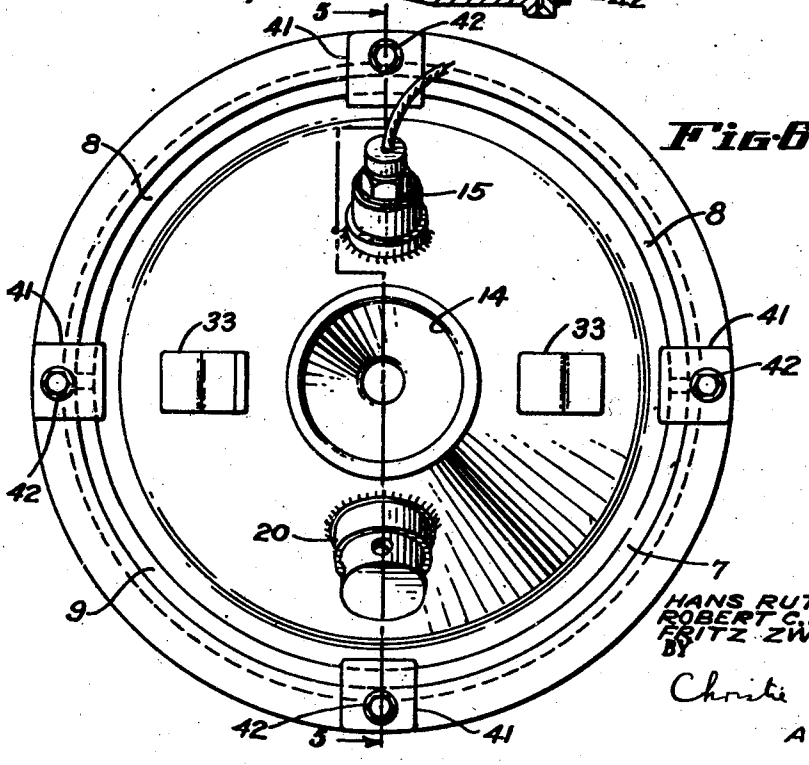


Fig. 6.



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TWO-PIECE JET THRUST MOTOR

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8 Claims. (Cl. 60—35.6)

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This invention relates to jet thrust motors and particularly to jet motors utilizing a propellant adapted to be placed in the combustion chamber of the motor.

Jet propulsion motors have heretofore been used in which solid propellant materials have been placed or cast into the combustion chamber and then ignited so that the gases of combustion rush out at high velocity through an exhaust nozzle to create the propelling thrust. In the use of such motors there has been some difficulty in reloading with a new propellant charge after the original propellant charge has been fired. This difficulty has been largely due to the fact that the motor must be taken apart in some way, for the parts have tended to become corroded or stuck together after a combustion has taken place. The object of this invention is to provide a motor construction which permits easy filling and refilling of the motor chamber with combustible propellant.

In accordance with our invention we provide a construction which readily permits the motor to be taken apart after a combustion for reloading. We have carried this out by building the motor in two parts to be attached together when the motor is loaded. A feature of the arrangement is the provision for holding one of the parts to the other, at least one of these holding devices being combustible so that after a combustion has occurred the attachable parts become loosened, permitting easy detachment.

The foregoing and other features of the invention will be better understood from the following detailed description taken in conjunction with the accompanying drawing in which:

Fig. 1 is an elevational view in part cross section along line 1—1 as shown in Fig. 2 of our invention;

Fig. 2 is an end view thereof;

Fig. 3 is a fractional view in cross section taken along line 3—3 in Fig. 4;

Fig. 4 is an end view of an alternate embodiment of our invention;

Fig. 5 is an elevational view in part cross section along line 5—5 in Fig. 6 of another embodiment of our invention; and

Fig. 6 is an end view thereof.

Similar numerals refer to similar parts throughout the several views.

In Figs. 1 and 2 we show a jet thrust motor comprising a tubular chamber 1 having an open end provided with a slightly enlarged collar 2 and a closed end, preferably in the shape of a curved cap 3 which provides a base for the solid

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propellant cartridges 17. Collar 2 has a recess 5 provided with a tapered entrance portion 6. A combustible ring 4 is inserted in the recess 5 and is made of a combustible substance which is hard and tough and somewhat resilient so as to act as a strong washer. Materials useful for this purpose are cellulose nitrate, methyl methacrylate, etc. Adjacent the tapered portion 6 in recess 5 a groove 7 is provided for receiving two halves 8 and 9 of a ring or if desired a snap ring 25 as shown in Fig. 4. The latter ring 25 or the two halves 8 and 9 may be of suitable material such as cast iron or steel. An exhaust nozzle 11, formed as a separate piece from the chamber portion, has a flange 12 which may be slightly undersized permitting ease of insertion into the recess 5 of collar 2. The groove 22 is provided in the flange 12 for receiving a resilient steel ring 23 which makes the connection pressure tight. Steel ring 23 is gradually contracted by the tapered portion 6 when inserting the exhaust nozzle flange 12 into the recess 5. Flange 12 forms a conical wall 16 contracting towards a constricted portion 13 which then flares outwardly forming an annular expanded portion 14.

An electric ignitor 15 is installed in the upper portion of wall 16 of the exhaust nozzle for igniting the propellant charge 17 in the chamber 1. A pressure relief device 20 is secured in the lower portion of wall 16 in a conventional manner. The pressure relief device 20 contains a diaphragm 19 which may be ruptured when the pressure in the chamber 1 reaches a predetermined maximum. The surplus gases escape through the holes 18 in the pressure relief device 20 thereby protecting the jet motor.

The propellants for this type of motor are frequently packed in the form of separate cartridges and such loose cartridges are adapted to be secured in the tubular chamber of the jet motor. This is done by the insertion of the above mentioned combustible ring 4 against the cartridge or cartridges in the chamber of the motor. The locking of the cartridges into the chamber is obtained by inserting the exhaust nozzle flange 12 into the recess 5 and driving it against ring 4. The whole assembly is then secured by the insertion of the two ring halves 8 and 9 which are held in place by the inserted screws 10.

The extreme end of the exhaust nozzle 11 is provided with threads 30. The threads 30 serve to secure a pipe cap 31 which has a concentric threaded hole into which a water hose 32 may be screwed. Two clips 33 may be provided in the wall 16 of the exhaust nozzle 11. These clips 33

may be part of the exhaust nozzle if the same is made of cast steel, or they may be welded if the exhaust nozzle is made of steel.

In operation the jet motor is fired by igniting the propellant charge 17. The electric ignitor 15 ignotes a small propellant charge (not shown) which injects a flame into the propellant charge 17, thereby igniting it. The ensuing combustion burns the combustible ring 4, but, while the combustion goes on the flange 12 of the nozzle remains held against ring halves 8 and 9 by the pressure in the chamber. The combustion generates a large amount of products of combustion which escape through the exhaust nozzle 11, producing the desired jet thrust. When the total charge is consumed flange 12 becomes loose within collar 2, since the ring 4 is now burned out. The motor can then readily be reloaded after it has cooled down sufficiently.

The reloading is performed by removing screws 10 and the two ring halves 8 and 9. In order to remove these halves the exhaust nozzle may be driven into the recess 5 as the combustible ring 4 has been previously consumed. The space, which ring 4 has occupied serves as the space in to which the flange 12 of the exhaust nozzle may be driven, permitting easy removal of the two halves 8 and 9 of the retaining ring. During the operation of the motor a certain amount of residue from the combustion may have been deposited in the clearance between recess 5 and the flange 12. This may prevent the easy removal of the exhaust nozzle. In order to speed up such removal the pipe cap 31 Fig. 1 may be screwed on the exhaust nozzle and water pressure is applied through hose 32 which pushes the nozzle out of the recess 5. Clips 33 serve to pull the nozzle out of the chamber if needed. After blowing out the dirt and ashes and some scrapings of the walls of the tubular chamber 1, a fresh supply of propellant cartridges is placed in the chamber, and a fresh combustible ring 4 is inserted into the recess 5 resting against the propellant cartridges. The cleaned exhaust nozzle is inserted into the recess 5 and forced against ring 4 permitting the insertion of the two halves 8 and 9 into the internal groove 6.

Screws 10 are screwed down locating the two halves 8 and 9. The motor is now ready for the next operation.

In Figs. 3 and 4 we show a construction which can be used alternatingly to that shown in Figs. 1 and 2. Figs. 3 and 4 show the same construction as in Figs. 1 and 2 except that instead of the retaining ring being of two halves 8 and 9 it is a snap retaining ring 25. When using the snap ring 25 as a retaining ring the screws 10 are not needed. Such snap ring may be of cast iron or resilient steel and may be contracted before permitting it to snap into the provided groove 6 in the recess 5 of collar 2 in the tubular chamber.

In Figs. 5 and 6 we show another modification of our invention. The steel ring 23 shown in Fig. 1 is eliminated. A slight taper of the exhaust nozzle flange 12 permits easy insertion into the recess 5 as shown in Fig. 5. Instead of the simple screws 10 a more elaborate construction is employed for securing the retaining ring halves 8 and 9. The outside face 40 of the collar 2 receives four clamps 41 for securing the two halves 8 and 9 in position. The four clamps 41 are tightened with the corresponding screws 42 into the outside face 40 of the collar 2.

After the firing of this embodiment is performed it has been found that the space between

the recess 5 and the tapered flange 12 is filled with sediment. This sediment may be washed out with water before attempting to drive the exhaust nozzle flange 12 down into the space provided by the burning of the combustible ring 4 in the recess 5. Clamps 41 are removed by unscrewing the screws 42 prior to the removal of the two ring halves 8 and 9.

It is understood that any of the above-described modifications are operable in the same manner as described under Figs. 1 and 2.

It is clear that we have provided a jet thrust motor which can be easily reloaded in the field or anywhere away from any assembling plant or the like.

We claim:

1. The combination in a jet propulsion motor having a combustion chamber member and an exhaust nozzle member for exhausting gases from said chamber, means for attaching and detaching the chamber member and the nozzle member, said means comprising a flange on one member and a collar on the other member adapted to fit within the flange, a pair of retaining rings held between said collar and flange, at least one of said rings being inflammable and adapted to be burned during the combustion within the chamber.

2. In a jet motor utilizing solid propellant material the combination comprising a combustion chamber having a closed end for supporting said propellant material and an open end provided with a recess, a combustible ring member for securing said propellant material in said chamber, an exhaust nozzle having a flange, said flange fitting into said recess and against said combustible ring member, a retaining member inserted in said recess for securing said exhaust nozzle in the chamber.

3. In a jet thrust motor the combination comprising a chamber for loading propellant material, said chamber having a closed end for supporting said propellant material and an open end provided with a recess, a combustible ring member in said recess for securing said propellant material in the chamber, an exhaust nozzle having a flange, said flange fitting into said recess and against said combustible ring member, a retaining member inserted in said recess for securing said exhaust nozzle in the chamber.

4. In a jet thrust motor the combination comprising a tubular chamber for storing propellant cartridges, said tubular chamber having a closed end for supporting said cartridges and an open end provided with a recess, a combustible ring member in said recess, an exhaust nozzle inserted in said recess and having a flange pressing against said combustible ring member thereby securing said propellant cartridges in the tubular chamber and, a retaining member for securing said exhaust nozzle in said tubular chamber.

5. In a jet thrust motor the combination comprising a chamber for burning propellant cartridges, said chamber having a closed end for supporting said cartridges and an open end provided with a recess, a combustible ring member in said recess, an exhaust nozzle having a flange inserted in said recess and against said combustible ring member thereby securing said propellant cartridges, an internal groove provided in said recess for receiving a retaining member, said retaining member connecting said tubular chamber and the exhaust nozzle.

6. In a jet thrust motor utilizing solid propellant cartridges, the combination comprising a fuel chamber having a closed end for supporting

said propellant cartridges and an open end provided with a recess, a combustible gasket in said recess, an exhaust nozzle having a flange for insertion into said recess and against said combustible gasket, an internal groove in said recess for receiving a retaining member, said retaining member connecting said fuel chamber and said exhaust nozzle.

7. In a jet thrust motor utilizing solid propellant cartridges, the combination comprising a propellant chamber having a closed end for receiving said propellant cartridges, an open end in said chamber having a collar provided with a recess, a combustible gasket inserted in said recess, an exhaust nozzle having a flange for insertion in said recess and against said combustible ring member, an internal groove in said recess for receiving a retaining member, said retaining member securing said propellant cartridges and connecting said chamber and the exhaust nozzle, the burning of said combustible ring providing clearance for forcing said flange into it, thereby permitting easy removal of said retaining member.

8. In a jet thrust motor utilizing solid propellant cartridges, the combination comprising a fuel chamber having a closed end for containing the propellant cartridges, and an open end provided with a collar having a recess, an exhaust nozzle having a flange, a combustible gasket in the recess between the flange and the chamber, said flange having a groove and said collar having a corresponding groove, and a resilient ring member engaged in the grooves of the collar and flange for retaining the flange in position against the combustible gasket.

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